

**DOCKET NO.: UPN- 4296 (P2957)**

**WE CLAIM:**

1. A PET detector comprising:  
a Lanthanum Halide scintillator comprising a plurality of Lanthanum Halide crystals;  
a light guide; and  
a plurality of photomultiplier tubes,  
wherein said Lanthanum Halide scintillator, said light guide and said photomultiplier tubes are arranged respectively peripherally around a cavity for accepting a patient.
2. A PET scanner comprising:  
a cavity for accepting a patient; and  
a plurality of PET detector modules arranged in an approximately cylindrical configuration about said cavity, each PET detector including a Lanthanum Halide scintillator comprising a plurality of Lanthanum Halide crystals, a light guide, and a plurality of photomultiplier tubes, wherein said Lanthanum Halide scintillator, said light guide and said photomultiplier tubes are arranged respectively peripherally around said cavity.
3. A PET scanning system comprising:  
a PET scanner comprising a cavity for accepting a patient and a plurality of PET detector modules arranged in an approximately cylindrical configuration about said cavity, each PET detector including a Lanthanum Halide scintillator comprising a plurality of Lanthanum Halide crystals, a light guide, and a plurality of photomultiplier tubes, wherein said Lanthanum Halide scintillator, said light guide and said photomultiplier tubes are arranged respectively peripherally around said cavity;  
a time stamp circuit that records the time of receipt of gamma rays by respective PET detectors and provides timing data outputs; and

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a processor that receives said timing data outputs, calculates time-of-flight (TOF) of gamma rays through a patient in the cavity, and uses said TOF of gamma rays in the reconstruction of images of the patient.